increasingly pronounced effects on freshwater outfalls in the Delta, especially during years with below average precipitation. Salinity levels in the vicinity of the discharge increase under such conditions. Saltwater intrusion and influence in the area increases during periods of low freshwater flow. As more water is diverted from the San Joaquin River for human use, the zone of saltwater intrusion extends farther upstream. Prior to 1984, this zone, termed the transition, entrapment, or null zone, was typically located in Suisun Bay during much of the year (October through March). Since 1984, the transition zone has shifted more or less permanently to the channels of the Sacramento and San Joaquin rivers.

Refer to section III.C.1 above for a complete description of the receiving water and beneficial uses.

b. **Effluent and Ambient Background Data.** The RPA, as described in section IV.C.3 of this Fact Sheet, was based on data from January 2015 through December 2017, which includes effluent and ambient background data submitted in SMR's. Additional data outside of this range was analyzed where there was inadequate data to perform an analysis. As described in Attachment E to this Order, the Discharger participates in the Delta Regional Monitoring Program. As a result, Order R5-2013-0157-01 did not include monitoring requirements for hardness in the receiving water. Therefore, where receiving water data was necessary to calculate hardness-dependent CTR metals criteria, monitoring conducted between October 2011 and July 2012 at Monitoring Location RSW-001 was also considered.

c. **Assimilative Capacity/Mixing Zone**

i. **Regulatory Guidance for Dilution Credits and Mixing Zones.** The CWA directs states to adopt water quality standards to protect the quality of their waters. U.S. EPA's current water quality standards regulation authorizes states to adopt general policies, such as mixing zones, to implement state water quality standards (40 C.F.R. sections 122.44 and 122.45). U.S. EPA allows states to have broad flexibility in designing mixing zone policies. Primary policy and guidance on determining mixing zones and dilution credits is provided by the SIP and the Basin Plan. If no procedure applies in the SIP or the Basin Plan, then the Central Valley Water Board may use the U.S. EPA *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) (TSD).

For non-priority pollutant constituents, the allowance of mixing zones by the Central Valley Water Board is discussed in the Basin Plan, *Policy for Application of Water Quality Objectives*, which states in part, "*In conjunction with the issuance of NPDES and storm water permits, the Regional Board may designate mixing zones within which water quality objectives will not apply provided the discharger has demonstrated to the satisfaction of the Regional Board that the mixing zone will not adversely impact beneficial uses. If allowed, different mixing zones may be designated for different types of objectives, including, but not limited to, acute aquatic life objectives, chronic aquatic life objectives, human health objectives, and acute and chronic whole effluent toxicity objectives, depending in part on the averaging period over which the objectives apply. In determining the size of such mixing zones, the Regional Board will consider the applicable procedures and guidelines in the EPA's Water Quality Standards Handbook and the* [TSD]. *Pursuant to EPA guidelines, mixing zones designated for acute aquatic life objectives will*

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generally be limited to a small zone of initial dilution in the immediate vicinity of the discharge."

For priority pollutants, the SIP supersedes the Basin Plan mixing zone provisions. Section 1.4.2 of the SIP states, in part, "*…with the exception of effluent limitations derived from TMDL's, in establishing and determining compliance with effluent limitations for applicable human health, acute aquatic life, or chronic aquatic life priority pollutant criteria/objectives or the toxicity objective for aquatic life protection in a basin plan, the Regional Board may grant mixing zones and dilution credits to dischargers…The applicable priority pollutant criteria and objectives are to be met through a water body except within any mixing zone granted by the Regional Board.* ***The allowance of mixing zones is discretionary and shall be determined on a discharge-by-discharge basis.*** *The Regional Board may consider allowing mixing zones and dilution credits only for discharges with a physically identifiable point of discharge that is regulated through an NPDES permit issued by the Regional Board.*" [emphasis added]

For incompletely-mixed discharges, the Discharger must complete an independent mixing zone study to demonstrate to the Central Valley Water Board that a dilution credit is appropriate. In granting a mixing zone, section 1.4.2.2 of the SIP requires the following to be met:

"***A mixing zone shall be as small as practicable****. The following conditions must be met in allowing a mixing zone:* [emphasis added]

A: A mixing zone shall not:

1. *compromise the integrity of the entire water body;*
2. *cause acutely toxic conditions to aquatic life passing through the mixing zone;*
3. *restrict the passage of aquatic life;*
4. *adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws;*
5. *produce undesirable or nuisance aquatic life;*
6. *result in floating debris, oil, or scum;*
7. *produce objectionable color, odor, taste, or turbidity;*
8. *cause objectionable bottom deposits;*
9. *cause nuisance;*
10. *dominate the receiving water body or overlap a mixing zone from different outfalls; or*
11. *be allowed at or near any drinking water intake. A mixing zone is not a source of drinking water. To the extent of any conflict between this determination and the Sources of Drinking Water Policy (Resolution 88-63), this SIP supersedes the provisions of that policy."*

Section 1.4.2.1 of the SIP establishes the authority for the Central Valley Water Board to consider dilution credits based on the mixing zone conditions in a receiving water. Section 1.4.2.1 in part states:

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"*The dilution credit, D, is a numerical value associated with the mixing zone that accounts for the receiving water entrained into the discharge. The dilution credit is a value used in the calculation of effluent limitations (described in section 1.4).* ***Dilution credits may be limited or denied on a pollutant-by-pollutant basis, which may result in a dilution credit for all, some, or no priority pollutants in the discharge.***" [emphasis added]

The mixing zone is thus an administrative construct defined as an area around the outfall that may exceed water quality objectives, but is otherwise protective of the beneficial uses. Dilution is defined as the amount of mixing that has occurred at the edge of this mixing zone under critical conditions, thus protecting the beneficial uses at the concentration and for the duration and frequency required.

ii. **San Joaquin River Characteristics.** The Facility discharges to the San Joaquin River at Jersey Island, which is within the tidal estuary of the Sacramento-San Joaquin Delta. The tidal zone in this area of the San Joaquin River includes flood and ebb tides, which move the river 5 miles upstream and downstream, and slack tides, which occur with no river movement for about 1 hour, twice each day. Multiple dosing of the receiving water with effluent occurs as the tide moves the water column upstream and downstream past the point of discharge. The complex dynamics of the stream flow, the tidal flows, the slack flows, and the state and federal pumping operations must be considered in an evaluation of the available dilution for the discharge. The San Joaquin River is approximately 3,300 feet wide at the location of the diffuser. The diffuser section is 150 feet long at a depth of 20 to 30 feet and extends 550 feet off-shore. The average tidal flow is 150,000 cfs and the average dry weather flow design capacity of the discharge is 4.3 MGD.

iii. **Dilution/Mixing Zone Study Results.** As described below, the Discharger submitted two mixing zone modeling reports as part of the October 2006 *Draft Supplemental Environmental Impact Report for Ironhouse Sanitary District Wastewater Treatment Plan Expansion* (Supplemental EIR) to support the allowance of mixing zones and dilution credits in previous Order R5-2008-0057. These reports include the October 2006 *Evaluation of Near-Field Patterns for the Ironhouse Sanitary District Proposed Diffuser* (Jones and Stokes) and the *Simulated Dilution and Transport of Ironhouse Sanitary District Treated Effluent to Contra Costa Water District (CCWD) and Antioch Water Supply Intakes* (Jones and Stokes) (2006 Modeling Studies). As discharges to the San Joaquin River had not yet commenced, Order R5-2008-0057 required the Discharger to conduct a mixing zone validation study to verify the predictions of the modeling analysis in the Supplemental EIR. Thus, the Discharger submitted an 18 February 2013 *Ironhouse Sanitary District Water Recycling Facility Mixing Zone Validation Study* (Robertson-Bryan, Inc.) (2013 Validation Study).

(a) **2006 Modeling Studies.** Jones and Stokes prepared an analysis of the mixing and transport of effluent within the Sacramento-San Joaquin Delta for the October 2006 Supplemental EIR. To evaluate the tidal dilution of the discharge, the Department of Water Resources' (DWR's) Delta Simulation Model II (DSM2) was used with baseline flows for reservoir operations based on CALSIM results for the 2020 Operations Criteria and Plan. The DWR DSM2 model is a one-dimensional mathematical model for dynamic simulation of one-dimensional hydrodynamics (HYDRO),

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water quality (QUAL) and particle tracking (PTM) that provides a simulation package for analysis of complex hydrodynamics, water quality, and ecological conditions in river and estuarine systems. The DSM2 model uses the 1976-1991 period as representative of tidal flows and salinity. The future Delta flow operations used in the DSM2 model are based on the United States Bureau of Reclamation (USBR) CALSIM model and uses monthly hydrology during 1922-1991 to simulate the future CVP and SWP operations. The 2020 Operations Criteria and Plan of CVP and SWP operations were developed by USBR in 2004. Based on the modeling analysis, the following mixing zone dimensions and dilution ratios were allowed in Order R5-2008-0057:

Table F-6. 2006 Mixing Zone/Dilution Study Results

Criteria/Beneficial Use	Effluent Contribution to Receiving Water Concentration	Mixing Zone Dimensions	Representative Effluent and Receiving Water Quality	Maximum Dilution Ratio
Acute (1-hour) aquatic life criteria (at slack tide)	5.19%[1]	175 ft. wide by 150 ft.	Maximum Concentration	20:1
Chronic (4-day) aquatic life criteria	3.53%[1]	175 ft. wide by 150 ft.	Maximum Concentration	28:1
Long-term human health criteria	0.10%[2]	5 miles upstream and downstream	Mean Concentration	1,000:1

[1] Maximum effluent concentration.
[2] Average effluent contribution.

(b) **2013 Validation Studies.** Field investigations of near-field mixing were conducted on 5 September 2012 and 10 October 2012. During each study, rhodamine WT dye was injected into the Facility's effluent discharge in the outfall pipe approximately 400 feet upstream of the diffuser. The 5 September 2012 dye release occurred as the receiving water transitioned from ebb to flood tide and included slack tide conditions, and the 10 October 2012 dye release occurred over a 13-hour period with slack tide conditions/flow reversals observed three times. The actual observed dilution ratios were 80:1 on 5 September 2012 and 90:1, 65:1, and 70:1 on 10 October 2012. During both dye release events, the observed effluent flow rate was approximately one-half the maximum permitted average dry weather flow rate of 4.3 MGD. In addition, both events include measurements taken during slack tide conditions. Given these effluent and receiving water conditions, the observed dilution ratios are consistent with the Supplemental EIR results.

Dye concentrations in the far-field were measured on 10 October 2012 from a series of locations that extended from 7,000 feet upstream to 3,000 feet downstream of the discharge. Dye was released in the discharge over a 13-hour period, which included flood and ebb tide conditions. Observed far-field dilutions on 10 October 2012 were on the order of 1,000:1 at 1,000-2,000 feet upstream or downstream of the discharge, which suggests that the DSM2 modeling results are likely to be conservative with respect to long-term chronic conditions. The 2013 Study results cannot completely confirm or disconfirm the far-field modeling due to the short durations of the dye injection studies (~13 hours); nevertheless, the 2013 Study results support that the modeled estimates

of far-field dilution are conservative. Thus, the mixing zone and dilution ratios were retained in Order R5-2013-0157-01.

iv. **Evaluation of Available Dilution for Acute and Chronic Aquatic Life Criteria.** U.S. EPA Region VIII, in its "*EPA Region VIII Mixing Zones and Dilution Policy*", recommends no dilution for acute aquatic life criteria, stating the following, "*In incomplete mix situations, discharge limitations to implement acute chemical-specific aquatic life criteria and narrative (no acute toxicity) criteria shall be based on achieving such acute criteria at the end-of-pipe (i.e., without an allowance for dilution). This approach is intended to implement the narrative requirement prohibiting acutely toxic conditions in the mixing zone.*"

The Discharger has requested acute and chronic aquatic life mixing zones for compliance with acute and chronic water quality criteria for copper and lead. Based on the mixing zone studies, the requested acute and chronic aquatic life mixing zones are less than 175 feet wide and extend less than 150 feet upstream or downstream of the diffuser depending on the direction of tidal flow.

The acute and chronic aquatic life mixing zones extending less than 150 feet upstream or downstream of the diffuser meet the requirements of the SIP as follows:

(a) *Shall not compromise the integrity of the entire water body* – The TSD states that, "*If the total area affected by elevated concentrations within all mixing zones combined is small compared to the total area of a water body (such as a river segment), then mixing zones are likely to have little effect on the integrity of the water body as a whole, provided that the mixing zone does not impinge on unique or critical habitats.*"[1] The width of the San Joaquin River at the diffuser is approximately 3,300 feet at the surface. The acute and chronic aquatic life mixing zones of 150 feet are approximately 175 feet wide. The mixing zones are small and make up less than one-half of the stream width. The aquatic life mixing zones do not compromise the integrity of the entire water body.

(b) *Shall not cause acutely toxic conditions to aquatic life passing through the mixing zone* – The SIP requires that the acute mixing zone be appropriately sized to prevent lethality to organisms passing through the mixing zone. U.S. EPA recommends that float times through a mixing zone less than 15 minutes ensure that there will not be lethality to passing organisms. The acute mixing zone extends 150 feet upstream or downstream of the diffuser depending on the direction of tidal flow. The worst-case condition for evaluating the acute dilution credits is slack tide, in which there is no river movement for approximately 1 hour, twice each day. Due to the design of the diffuser ports, each port will maintain a jet velocity of 5 feet per second (fps), allowing for turbulent mixing and rapid river entrainment. Furthermore, this Order includes acute toxicity effluent limitations that require compliance to be determined based on acute bioassays using 100 percent effluent. Compliance with these requirements ensures that acute toxic conditions to aquatic life passing through the acute and chronic mixing zones do not occur.

(c) *Shall not restrict the passage of aquatic life* – The Discharger's 2006 Modeling Studies and the 2013 Validation Study evaluated the near-

[1] TSD, pg. 33

field effects of the discharge. The Discharger evaluated the zone of passage around the mixing zone where water quality objectives are met. The results of the mixing zone studies indicate there is an adequate zone of passage for aquatic life that is at least one-half the width of the San Joaquin River.

(d) *Shall not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or state endangered species laws* – The acute and chronic mixing zones will not cause acutely toxic conditions, allow adequate zones of passage, and are sized appropriately to ensure that there will be no adverse impacts to biologically sensitive or critical habitats.

(e) *Shall not produce undesirable or nuisance aquatic life; result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits; cause nuisance* – The current discharge has not been shown to result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits; or cause nuisance. This Order requires the discharge to meet tertiary filtration requirements set forth in CCR, Title 22, division 4, chapter 15 (Title 22) (or equivalent) tertiary filtration, which will ensure continued compliance with these mixing zone requirements. Therefore, the allowance of acute and chronic aquatic life mixing zones will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits, or cause nuisance.

(f) *Shall not dominate the receiving water body or overlap a mixing zone from different outfalls* – The acute and chronic mixing zones are small relative to the water body, so they will not dominate the water body. Furthermore, the mixing zones do not overlap mixing zones from other outfalls. There are no outfalls or mixing zones in the vicinity of the discharge.

(g) *Shall not be allowed at or near any drinking water intake* – The acute and chronic mixing zones are not near a drinking water intake.

The acute and chronic aquatic life mixing zones, therefore, comply with the SIP. The mixing zones also comply with the Basin Plan, which requires that the mixing zones not adversely impact beneficial uses. Beneficial uses will not be adversely affected for the same reasons discussed above. In determining the size of the mixing zones, the Central Valley Water Board considered the procedures and guidelines in U.S. EPA's *Water Quality Standards Handbook, 2nd Edition* (updated July 2007), section 5.1, and section 2.2.2 of the TSD. The SIP incorporates the same guidelines.

v. **Evaluation of Available Dilution for Human Health Criteria.** Section 1.4.2.2 of the SIP provides that mixing zones should not be allowed at or near drinking water intakes. Furthermore, regarding the application of a mixing zone for the protection of human health, the TSD states that, "*…the presence of mixing zones should not result in significant health risks, when evaluated using reasonable assumptions about exposure pathways. Thus, where drinking water contaminants are a concern, mixing zones should not encroach on drinking water intakes.*" There are no drinking water intakes in the human health mixing zone.

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Based on the Discharger's 2006 Modeling Studies and 2013 Validation Study, the human health mixing zone extends 5 miles upstream and downstream of the diffuser and a dilution credit of 1,000:1 is justified. The human health mixing zone meets the requirements of the SIP as follows:

(a) *Shall not compromise the integrity of the entire water body* – The TSD states that, "*If the total area affected by elevated concentrations within all mixing zones combined is small compared to the total area of a water body (such as a river segment), then mixing zones are likely to have little effect on the integrity of the water body as a whole, provided that the mixing zone does not impinge on unique or critical habitats.*"[1] The human health mixing zone is not applicable to aquatic life criteria. The human health mixing zone does not compromise the integrity of the entire water body.

(b) *Shall not cause acutely toxic conditions to aquatic life passing through the mixing zone* – The human health mixing zone is not applicable to aquatic life criteria. Therefore, acutely toxic conditions will not occur in the mixing zone.

(c) *Shall not restrict the passage of aquatic life* – The human health mixing zone is not applicable to aquatic life criteria. Therefore, the mixing zone will not restrict the passage of aquatic life.

(d) *Shall not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws* – The human health mixing zone is not applicable to aquatic life criteria. The mixing zone will not impact biologically sensitive or critical habitats.

(e) *Shall not produce undesirable or nuisance aquatic life; result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits; cause nuisance* – The allowance of a human health mixing zone will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits; or cause nuisance. This Order requires the discharge to meet Title 22 (or equivalent) tertiary filtration, which will ensure continued compliance with these mixing zone requirements. Therefore, the allowance of a human health mixing zone will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits, or cause nuisance.

(f) *Shall not dominate the receiving water body or overlap a mixing zone from different outfalls* – The human health mixing zone is small relative to the water body, so it will not dominate the water body. Furthermore, the mixing zone does not overlap mixing zones from other outfalls. There are no outfalls or mixing zones in the vicinity of the discharge.

(g) *Shall not be allowed at or near any drinking water intake* – The human health mixing zone is not near a drinking water intake.

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[1] TSD, pg. 33

The human health mixing zone, therefore, complies with the SIP. The mixing zone also complies with the Basin Plan, which requires that the mixing zone not adversely impact beneficial uses. Beneficial uses will not be adversely affected for the same reasons discussed above. In determining the size of the mixing zone, the Central Valley Water Board considered the procedures and guidelines in U.S. EPA's *Water Quality Standards Handbook, 2nd Edition* (updated July 2007), section 5.1, and section 2.2.2 of the TSD. The SIP incorporates the same guidelines.

vi. **Evaluation of Available Dilution for Specific Constituents (Pollutant-by-Pollutant Evaluation).**

(a) **Copper.** The receiving water contains assimilative capacity for copper and acute and chronic aquatic life criteria mixing zones meet the mixing zone requirements of the SIP. For copper, the WQBELs based on acute dilution credit of 20:1 and chronic dilution credit of 28:1 are an average monthly effluent limitation (AMEL) and maximum daily effluent limitation (MDEL) of 18 µg/L and 36 µg/L, respectively. Section 1.4.2.2 of the SIP requires that, "*A mixing zone shall be as small as practicable.*", and Section 1.4.2.2.B requires, "*The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements.*" Considering Facility performance the mixing zone for copper is considered as small as practicable, and fully meets the requirements of the SIP.

The mixing zones and dilution credits for copper permitted in this Order will result in a minor increase in the discharge (i.e., use 3.4 percent of the available assimilative capacity in the receiving water). According to U.S. EPA's memorandum on Tier 2 Antidegradation Reviews and Significance Thresholds, any individual decision to lower water quality for non-bioaccumulative chemicals that is limited to 10 percent of the available assimilative capacity represents minimal risk to the receiving water and is fully consistent with the objectives and goals of the Clean Water Act. The mixing zones are as small as practicable for this Facility and the increased loading complies with the state and federal antidegradation requirements.

(b) **Lead**. The receiving water contains assimilative capacity for lead and acute and chronic aquatic life criteria mixing zones meet the mixing zone requirements of the SIP. For lead, the WQBELs based on no acute dilution credit and a chronic dilution credit of 11.5:1 are an average monthly effluent limitation (AMEL) and maximum daily effluent limitation (MDEL) of 7.5 µg/L and 15 µg/L, respectively. Section 1.4.2.2 of the SIP requires that, "*A mixing zone shall be as small as practicable.*", and Section 1.4.2.2.B requires, "*The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements.*" Considering Facility performance the mixing zone for lead is considered as small as practicable, and fully meets the requirements of the SIP.

The mixing zone and dilution credit for lead permitted in this Order will result in a minor increase in the discharge (i.e., use 0.9 percent of the

available assimilative capacity in the receiving water). According to U.S. EPA's memorandum on Tier 2 Antidegradation Reviews and Significance Thresholds, any individual decision to lower water quality for non-bioaccumulative chemicals that is limited to 10 percent of the available assimilative capacity represents minimal risk to the receiving water and is fully consistent with the objectives and goals of the Clean Water Act. The mixing zones are as small as practicable for this Facility and the increased loading complies with the state and federal antidegradation requirements.

Table F-7. Dilution Credits

Pollutant					Dilution Credit
Copper, Total Recoverable					20 (acute) 28 (chronic)
Lead, Total Recoverable					0 (acute) 11.5 (chronic)

(c) **Ammonia and Nitrate Plus Nitrite.** Although assimilative capacity is available and dilution credits for aquatic life and human health are allowed, this Order does not allow for mixing zones or dilution credits for ammonia or nitrate plus nitrite, since the Facility is capable of full nitrification and denitrification and the Discharger's antidegradation analysis for the existing Facility did not consider dilution.

(d) **Chronic Whole Effluent Toxicity (WET).** As discussed in section IV.C.2.iv, above, a mixing zone for chronic toxicity meets the requirements of the SIP. Section 1.4.2.2 of the SIP requires that, "*A mixing zone shall be as small as practicable,*" and section 1.4.2.2.B requires, "*The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements.*" Based on the Discharger's mixing zone studies, the chronic aquatic life mixing zone extends 150 feet upstream or downstream of the diffuser depending on the direction of tidal flow. Previous Order R5-2008-0057 included a chronic WET monitoring trigger of 16 TUc, which allows for a dilution credit of 16:1. This Order retains the chronic WET numeric trigger of 16 TUc.

vii. **Regulatory Compliance for Dilution Credits and Mixing Zones.** To fully comply with all applicable laws, regulations and policies of the state, the Central Valley Water Board-approved mixing zones and the associated dilution credits are based on the following:

(a) Mixing zones are allowed under the SIP provided all elements contained in section 1.4.2.2 are met. Based on the mixing zone studies conducted by the Discharger, the Central Valley Water Board has determined that these factors are met.

(b) Section 1.4.2.2. of the SIP requires mixing zones to be as small as practicable. Based on the mixing zone studies conducted by the Discharger, the Central Valley Water Board has determined the mixing zones are as small as practicable.

(c) In accordance with section 1.4.2.2 of the SIP, the Central Valley Water Board has determined the mixing zones are as small as practicable and

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will not compromise the integrity of the entire water body, restrict the passage of aquatic life, dominate the water body, or overlap existing mixing zones from different outfalls. The mixing zones are small relative to the large size of the receiving water and do not overlap a mixing zone from a different outfall. Additionally, there are no known downstream drinking water intakes.

(d) The Central Valley Water Board is allowing mixing zones for acute aquatic life, chronic aquatic life, and human health constituents, and has determined allowing such mixing zones will not cause acutely toxic conditions to aquatic life passing through the mixing zone.

(e) The Central Valley Water Board has determined the discharge will not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under the federal or state endangered species laws, because the mixing zones are relatively small and acutely toxic conditions will not occur in the mixing zones. The discharge will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum, produce objectionable odor, taste, or turbidity, cause objectionable bottom deposits, or cause nuisance, because the Order establishes end-of-pipe effluent limitations (e.g., for BOD_5 and TSS) and discharge prohibitions to prevent these conditions from occurring.

(f) As required by the SIP, in determining the extent of or whether to allow mixing zones and dilution credits, the Central Valley Water Board has considered the presence of pollutants in the discharge that are carcinogenic, mutagenic, teratogenic, persistent, bioaccumulative, or attractive to aquatic organisms, and concluded that the allowance of the mixing zones and dilution credits are adequately protective of the beneficial uses of the receiving water.

(g) The Central Valley Water Board has determined the mixing zones comply with the SIP for priority pollutants.

(h) Section 1.4.2.2.B of the SIP, in part states, *"The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements."* The Central Valley Water Board has determined full allowance of dilution is not needed or necessary for the Discharger to achieve compliance with effluent limitations for all constituents in this Order.

(i) The Central Valley Water Board has determined the mixing zones comply with the Basin Plan for non-priority pollutants. The Basin Plan requires a mixing zone not adversely impact beneficial uses. Beneficial uses will not be adversely affected for the same reasons discussed above. In determining the size of the mixing zones, the Central Valley Water Board has considered the procedures and guidelines in section 5.1 of U.S. EPA's *Water Quality Standards Handbook*, 2nd Edition (updated July 2007) and section 2.2.2 of the TSD. The SIP incorporates the same guidelines.

(j) The Central Valley Water Board has determined that allowing dilution factors that exceed those proposed by this Order would not comply with the State Antidegradation Policy for receiving waters outside the allowable

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mixing zone for copper and lead. The State Antidegradation Policy incorporates the federal Antidegradation Policy and requires that existing quality of waters be maintained unless degradation is justified based on specific findings. Item 2 of the State Antidegradation Policy states:

"*Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.*"

The effluent limitations established in the Order for copper and lead have been adjusted for dilution credits based on Facility performance. The Central Valley Water Board determined the effluent limitations required by this Order will result in the Discharger implementing BPTC of the discharge necessary to assure that pollution or nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the state will be maintained. The Central Valley Water Board also determined the Discharger will be in immediate compliance with the effluent limitations.

Therefore, the Central Valley Water Board has determined the effluent limitations established in the Order for copper and lead, which have been adjusted for dilution credits, are appropriate and necessary to comply with the Basin Plan, SIP, federal antidegradation regulations and the State Antidegradation Policy.

d. **Conversion Factors.** The CTR contains aquatic life criteria for arsenic, cadmium, chromium III, chromium VI, copper, lead, nickel, silver, and zinc, which are presented in dissolved concentrations. U.S. EPA recommends conversion factors to translate dissolved concentrations to total concentrations. The default U.S. EPA conversion factors contained in Appendix 3 of the SIP were used to convert the applicable dissolved criteria to total recoverable criteria.

e. **Hardness-Dependent CTR Metals Criteria.** The CTR and the NTR contain water quality criteria for seven metals that vary as a function of hardness. The lower the hardness, the lower the water quality criteria. The metals with hardness-dependent criteria include cadmium, copper, chromium III, lead, nickel, silver, and zinc.

This Order has established the criteria for hardness-dependent metals based on the hardness of the receiving water (actual ambient hardness) as required by the SIP[1] and the CTR.[2] The SIP and the CTR require the use of "receiving water" or "actual ambient" hardness, respectively, to determine effluent limitations for these metals. The CTR requires that the hardness values used shall be consistent with the design discharge conditions for design flows and mixing zones.[3] Design flows for aquatic life criteria include the lowest 1-day flow with an average reoccurrence frequency of

[1] The SIP does not address how to determine the hardness for application to the equations for the protection of aquatic life when using hardness-dependent metals criteria. It simply states, in section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water.

[2] The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used (40 C.F.R. § 131.38(c)(4)).

[3] 40 C.F.R. §131.3(c)(4)(ii)

once in 10 years (1Q10) and the lowest average 7 consecutive day flow with an average reoccurrence frequency of once in 10 years (7Q10).[1] This section of the CTR also indicates that the design conditions should be established such that the appropriate criteria are not exceeded more than once in a 3-year period, on average.[2] The CTR requires that when mixing zones are allowed, the CTR criteria apply at the edge of the mixing zone, otherwise the criteria apply throughout the water body including at the point of discharge.[3] The CTR does not define the term "ambient," as applied in the regulations. Therefore, the Central Valley Water Board has considerable discretion to consider upstream and downstream ambient conditions when establishing the appropriate water quality criteria that fully comply with the CTR and SIP.

i. **Summary Findings**

The ambient hardness for the San Joaquin River is represented by the data in Figure F-1, below, which shows ambient hardness ranging from 44 mg/L to 130 mg/L based on collected ambient data from October 2011 through July 2012 and January 2015 through December 2017. Given the high variability in ambient hardness values, there is no single hardness value that describes the ambient receiving water for all possible scenarios (e.g., minimum, maximum). Because of this variability, staff has determined that based on the ambient hardness concentrations measured in the receiving water, the Central Valley Water Board has discretion to select ambient hardness values within the range of 44 mg/L (minimum) up to 130 mg/L (maximum). Staff recommends that the Central Valley Water Board use the ambient hardness values shown in Table F-8 for the following reasons.

(a) Using the ambient receiving water hardness values shown in Table F-8 will result in criteria and effluent limitations that ensure protection of beneficial uses under all ambient receiving water conditions.

(b) The Water Code mandates that the Central Valley Water Board establish permit terms that will ensure the reasonable protection of beneficial uses. In this case, using the lowest measured ambient hardness to calculate effluent limitations is not required to protect beneficial uses. Calculating effluent limitations based on the lowest measured ambient hardness is not required by the CTR or SIP, and is not reasonable as it would result in overly conservative limits that will impart substantial costs to the Discharger and ratepayers without providing any additional protection of beneficial uses. In compliance with applicable state and federal regulatory requirements, after considering the entire range of ambient hardness values, Central Valley Water Board staff has used the ambient hardness values shown in Table F-8 to calculate the proposed effluent limitations for hardness-dependent metals. The proposed effluent limitations are protective of beneficial uses under all flow conditions.

(c) Using an ambient hardness that is higher than the minimum of 44 mg/L will result in limits that may allow increased metals to be discharged to the San Joaquin River, but such discharge is allowed under the State Antidegradation Policy (State Water Board Resolution 68-16). The Central Valley Water Board finds that this degradation is consistent with the

[1] 40 C.F.R. §131.38(c)(2)(iii) Table 4
[2] 40 C.F.R. §131.38(c)(2)(iii) Table 4, notes 1 and 2
[3] 40 C.F.R. §131.38(c)(2)(i)

Antidegradation Policy (see antidegradation findings in section IV.D.4 of the Fact Sheet). The Antidegradation Policy requires the Discharger to meet WDR's that will result in the BPTC of the discharge necessary to assure that: a) a pollution or nuisance will not occur, and b) the highest water quality consistent with maximum benefit to the people of the state will be maintained.

(d) Using the ambient hardness values shown in Table F-8 is consistent with the CTR and SIP's requirements for developing metals criteria.

Table F-8. Summary of CTR Criteria for Hardness-dependent Metals

CTR Metals	Ambient Hardness (mg/L)[2]	CTR Criteria (µg/L, total recoverable)[1]	
		Acute	Chronic
Copper	88	12	8.4
Chromium III	88	1,600	190
Cadmium	88 (acute) 88 (chronic)	3.9	2.2
Lead	74	56	2.2
Nickel	88	420	47
Silver	74	2.4	--
Zinc	88	110	110

[1] Metal criteria rounded to two significant figures in accordance with the CTR (40 C.F.R. section 131.38(b)(2)).

[2] The ambient hardness values in this table represent actual observed receiving water hardness measurements from the data set shown in Figure F-1.

ii. **Background**

The State Water Board provided direction regarding the selection of hardness in two precedential water quality orders; WQO 2008-0008 for the City of Davis Wastewater Treatment Plant (Davis Order) and WQO 2004-0013 for the Yuba City Wastewater Treatment Plant (Yuba City Order). The State Water Board recognized that the SIP and the CTR do not discuss the manner in which hardness is to be ascertained, thus regional water boards have considerable discretion in determining ambient hardness so long as the selected value is protective of water quality criteria under the given flow conditions. (Davis Order, p.10). The State Water Board explained that it is necessary that, "*The [hardness] value selected should provide protection for all times of discharge under varying hardness conditions.*" (Yuba City Order, p. 8). The Davis Order also provides that, "*Regardless of the hardness used, the resulting limits must always be protective of water quality criteria under all flow conditions.*" (Davis Order, p. 11)

The equation describing the total recoverable regulatory criterion, as established in the CTR, is as follows:

CTR Criterion = WER x ($e^{m[\ln(H)]+b}$) (Equation 1)

Where:

H = ambient hardness (as $CaCO_3$) [1]

[1] For this discussion, all hardness values are expressed in mg/L as $CaCO_3$.

WER = water-effect ratio

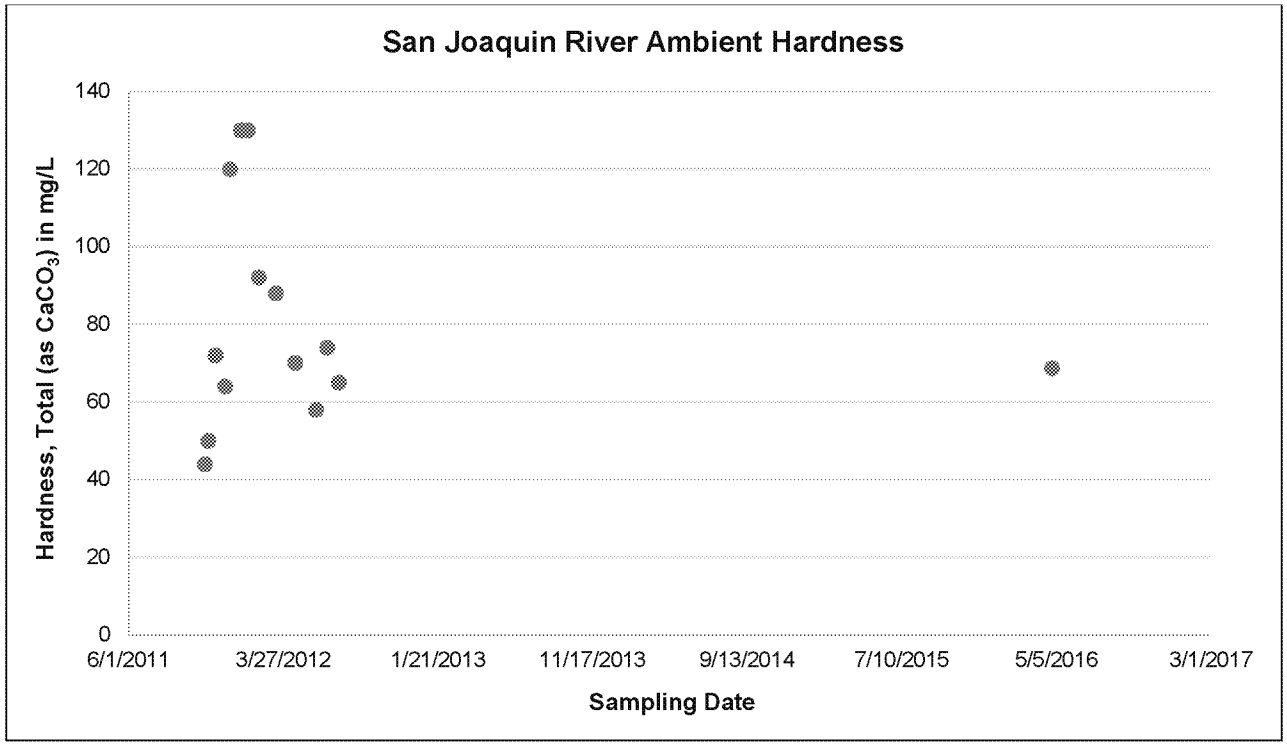
m, b = metal- and criterion-specific constants

The direction in the CTR regarding hardness selection is that it must be based on ambient hardness and consistent with design discharge conditions for design flows and mixing zones. Consistent with design discharge conditions and design flows means that the selected "design" hardness must result in effluent limitations under design discharge conditions that do not result in more than one exceedance of the applicable criteria in a 3-year period.[1] Design flows for aquatic life criteria include the 1Q10 and the 7Q10. The 1Q10 and 7Q10 San Joaquin River flows are 160 cfs and 223 cfs, respectively.

iii. **Ambient Conditions**

The ambient receiving water hardness varied from 44 mg/L to 130 mg/L based on 13 samples from October 2011 through July 2012 and one sample from January 2015 through December 2017 (see Figure F-1).

Figure F-1. Observed Ambient Hardness Concentrations 44 mg/L – 130 mg/L



In this analysis, the entire range of ambient hardness concentrations shown in Figure F-1 were considered to determine the appropriate ambient hardness to calculate the CTR criteria and effluent limitations that are protective under all discharge conditions.

iv. **Approach to Derivation of Criteria Where No Dilution Allowed**

As shown above, ambient hardness is variable. Because of the variation, there is no single hardness value that describes the ambient receiving water for all possible scenarios (e.g., minimum, maximum, mid-point). While the hardness

[1] 40 C.F.R. §131.38(c)(2)(iii) Table 4, notes 1 and 2

selected must be hardness of the ambient receiving water, selection of an ambient receiving water hardness that is too high would result in effluent limitations that do not protect beneficial uses. Also, the use of minimum ambient hardness would result in criteria that may not be representative considering the wide range of ambient conditions.

Reasonable worst-case ambient conditions. To determine whether a selected ambient hardness value results in effluent limitations that are fully protective while complying with federal regulations and state policy, staff have conducted an analysis considering varying ambient hardness and flow conditions. To do this, the Central Valley Water Board has ensured that the receiving water hardness and criteria selected for effluent limitations are protective under "reasonable-worst case ambient conditions." These conditions represent the receiving water conditions under which derived effluent limitations would ensure protection of beneficial uses under all ambient flow and hardness conditions.

Reasonable worst-case ambient conditions:

(a) "Low receiving water flow." CTR design discharge conditions (1Q10 and 7Q10) have been selected to represent reasonable worst-case receiving water flow conditions.

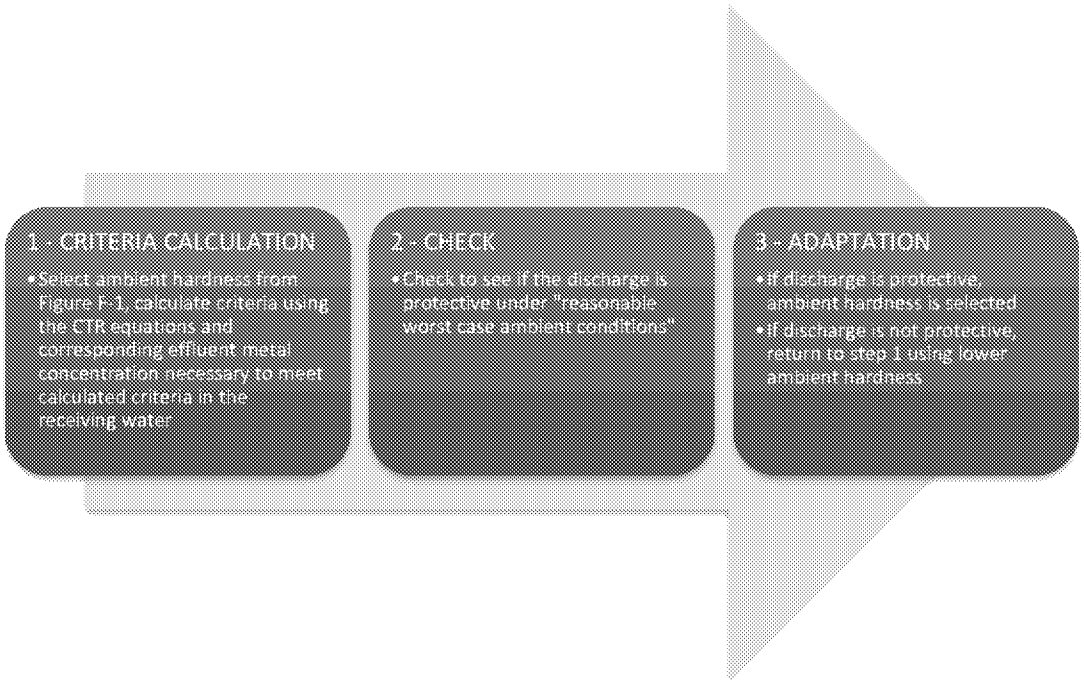
(b) "High receiving water flow (maximum receiving water flow)." This additional flow condition has been selected consistent with the Davis Order, which required that the hardness selected be protective of water quality criteria under all flow conditions.

(c) "Low receiving water hardness." The minimum receiving water hardness condition of 44 mg/L was selected to represent the reasonable worst-case receiving water hardness.

(d) "Background ambient metal concentration at criteria." This condition assumes that the metal concentration in the background receiving water is equal to CTR criteria (upstream of the Facility's discharge). Based on data in the record, this is a design condition that does not regularly occur in the receiving water and is used in this analysis to ensure that limits are protective of beneficial uses even in the situation where there is no assimilative capacity.

Iterative approach. An iterative analysis has been used to select the ambient hardness to calculate the criteria that will result in effluent limitations that protect beneficial uses under all flow conditions.

The iterative approach is summarized in the following algorithm and described below in more detail.



(a) CRITERIA CALCULATION. CTR criteria are calculated using the CTR equations based on actual measured ambient hardness sample results, starting with the maximum observed ambient hardness of 130 mg/L. Effluent metal concentrations necessary to meet the above calculated CTR criteria in the receiving water are calculated in accordance with the SIP.[1] This should not be confused with an effluent limit. Rather, it is the Effluent Concentration Allowance (ECA), which is synonymous with the WLA defined by U.S. EPA as "*a definition of effluent water quality that is necessary to meet the water quality standards in the receiving water.*"[2] If effluent limits are found to be needed, the limits are calculated to enforce the ECA considering effluent variability and the probability basis of the limit.

(b) CHECK. U.S. EPA's simple mass balance equation[3] is used to evaluate if discharge at the computed ECA is protective. Resultant downstream metal concentrations are compared with downstream calculated CTR criteria under reasonable worst-case ambient conditions.

(c) ADAPT. If step b results in:

(1) Receiving water metal concentration that complies with CTR criteria under reasonable worst-case ambient conditions, then the hardness value is selected.

(2) Receiving water metal concentration greater than CTR criteria, then return to step a, selecting a lower ambient hardness value.

[1] SIP section 1.4.B, Step 2, provides direction for calculating the Effluent Concentration Allowance.
[2] U.S. EPA Technical Support Document for Water Quality-Based Toxics Control (TSD), pg. 96.
[3] U.S. EPA NPDES Permit Writers' Handbook (EPA 833-K-10-001 September 2010, pg. 6-24)

The CTR's hardness-dependent metals criteria equations contain metal-specific constants, so the criteria vary depending on the metal. Therefore, steps a through c must be repeated separately for each metal until ambient hardness values are determined that will result in criteria and effluent limitations that comply with the CTR and protect beneficial uses for all metals.

v. **Results of Iterative Analysis Where No Dilution Allowed**

The above iterative analysis for each CTR hardness-dependent metal results in the selected ambient hardness values shown in Table F-8, above. Using these hardness values to calculate criteria, which are actual sample results collected in the receiving water, will result in effluent limitations that are protective under all ambient flow conditions. Zinc and silver are used as examples below to illustrate the results of the analysis. Tables F-9 and F-10, below, summarize the numeric results of the three-step iterative approach for zinc and silver. As shown in the example tables, ambient hardness values of 88 mg/L (zinc) and 74 mg/L (silver) are used in the CTR equations to derive criteria and effluent limitations. Then, under the "check" step, worst-case ambient receiving water conditions are used to test whether discharge results in compliance with CTR criteria and protection of beneficial uses.

The results of the above analysis, summarized in the tables below, show that the ambient hardness values selected using the three-step iterative process results in protective effluent limitations that achieve CTR criteria under all flow conditions. Tables F-9 and F-10, below, summarize the critical flow conditions. However, the analysis evaluated all flow conditions to ensure compliance with the CTR criteria at all times.

Table F-9. Verification of CTR Compliance for Zinc

Receiving water hardness used to compute effluent limitations				**88 mg/L**
	Effluent Concentration Allowance (ECA) for Zinc[1]			**108 µg/L**
	Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Zinc Concentration[2] (µg/L)**	
1Q10	46	61.9	61.7	**Yes**
7Q10	45	61.3	61.1	**Yes**
Max receiving water flow	44	59.8	59.8	**Yes**

1 The ECA defines effluent quality necessary to meet the CTR criteria in the receiving water.

2 This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.

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Table F-10. Verification of CTR Compliance for Silver

Receiving water hardness used to compute effluent limitations				74 mg/L
Effluent Concentration Allowance (ECA) for Silver[1]				2.4 µg/L
	Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions			Complies with CTR Criteria?
	Hardness	CTR Criteria (µg/L)	Ambient Silver Concentration[2] (µg/L)	
1Q10	46	1.1	1.0	Yes
7Q10	45	1.0	1.0	Yes
Max receiving water flow	44	1.0	1.0	Yes

1 The ECA defines effluent quality necessary to meet the CTR criteria in the receiving water. There is no effluent limitation for silver as it demonstrates no reasonable potential.

2 This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.

vi. **Approach to Derivation of Criteria Where Dilution Allowed**

As discussed in Section IV.C.2 c, above, dilution credits for copper and lead have been allowed in the calculation of WQBELs for these hardness-dependent criteria parameters. As discussed in Section IV.C.2.c, above, the allowed copper dilution credit for chronic aquatic life criteria is 28:1, which represents an effluent fraction of 3.4%, and the allowed lead dilution credit for chronic aquatic life criteria is 11.5:1, which results in an effluent fraction of 8.0%. These values define the points in the receiving water (i.e., edge of mixing zone) that must be in compliance with aquatic life criteria. When the effluent and receiving water are at their respective minimum observed hardness values (i.e., 92 mg/L and 44 mg/L as $CaCO_3$, respectively), and the effluent fraction is 3.4% and 8.0%, the mixed hardness is 46 mg/L and 48 mg/L (as CaCO3), respectively. Therefore, an actual observed ambient hardness of 44 mg/L (as $CaCO_3$) has been used in this Order for calculating hardness-dependent copper and lead chronic criteria. Using the ambient hardness to calculate the hardness-dependent metals criteria is consistent with the CTR and the SIP.

Tables F-11 and F-12, below, demonstrate that protective effluent limitations result when using this approach for determining the appropriate hardness. In this example the mixed receiving water copper and lead concentrations do not exceed the mixed CTR criteria for copper and lead at the edge of the mixing zone.

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Table F-11. Verification of CTR Compliance for Copper

Minimum Ambient Background Hardness				**44 mg/L**
Minimum Effluent Hardness				**92 mg/L**
Chronic Aquatic Life Dilution Credit				**28:1**
Maximum Ambient Background Copper Concentration				**4.0 µg/L**
Effluent Concentration Allowance (ECA) for Copper[1]				**22 µg/L**
Effluent Fraction[2]	**Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions**			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Copper Concentration[3] (µg/L)**	
1.0%	44	4.7	4.2	**Yes**
2.0%	45	4.7	4.4	**Yes**
3.0%	45	4.8	4.5	**Yes**
3.4%	46	4.8	4.6	**Yes**

1 ECA calculated per Section 1.4 of the SIP.

2 Table shows effluent fractions ranging from 1% to 3.4% to show conditions outside the approved mixing zone for copper.

3 This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.

Table F-12. Verification of CTR Compliance for Lead

Minimum Ambient Background Hardness				**44 mg/L**
Minimum Effluent Hardness				**92 mg/L**
Chronic Aquatic Life Dilution Credit				**11.5:1**
Maximum Ambient Background Lead Concentration				**0.419 µg/L**
Effluent Concentration Allowance (ECA) for Lead[1]				**9.2 µg/L**
Effluent Fraction[2]	**Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions**			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Lead Concentration[3] (µg/L)**	
1.0%	44	1.1	0.5	**Yes**
2.0%	45	1.1	0.6	**Yes**
3.0%	46	1.2	0.7	**Yes**
4.0%	46	1.2	0.8	**Yes**
5.0%	46	1.2	0.9	**Yes**
8.0%	48	1.2	1.1	**Yes**

1 ECA calculated per Section 1.4 of the SIP.

2 Table shows effluent fractions ranging from 1% to 8.0% to show conditions outside the approved mixing zone for lead.

3 This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.

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3. Determining the Need for WQBEL's

Clean Water Act section 301(b)(1)(C) requires effluent limitations necessary to meet water quality standards, and 40 C.F.R. section 122.44(d) requires NPDES permits to include conditions that are necessary to achieve water quality standards established under section 303 of the CWA, including state narrative criteria for water quality. Federal regulations at 40 C.F.R. section 122.44(d)(1)(i) state, "*Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.*" Additionally, 40 C.F.R. section 122(d)(1)(vii) requires effluent limits to be developed consistent with any available WLA's developed and approved for the discharge. The process to determine whether a WQBEL is required as described in 40 C.F.R. section 122.44(d)(1)(i) is referred to as an RPA. Central Valley Water Board staff conducted RPA's for nearly 200 constituents, including the 126 U.S. EPA priority toxic pollutants. This section includes details of the RPA's for constituents of concern for the Facility. The entire RPA is included in the administrative record and a summary of the constituents of concern is provided in Attachment G. For priority pollutants, the SIP dictates the procedures for conducting the RPA. For non-priority pollutants the Central Valley Water Board is not restricted to one particular RPA method; therefore, the RPA's have been conducted based on U.S. EPA guidance considering multiple lines of evidence and the site-specific conditions of the discharge.

a. **Constituents with Total Maximum Daily Loads (TMDL's).** 40 C.F.R. section 122.44(d)(1)(vii) provides: *"When developing water quality-based effluent limits under [§ 122.44(d)(1)], the permitting authority shall ensure that: (A) The level of water quality to be achieved by limits on point sources established under this paragraph is derived from, and complies with all applicable water quality standards; and (B) Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with the assumptions and requirements of any available waste load allocation for the discharge prepared by the State and approved by EPA pursuant to [Total Maxiumum Daily Loads regulations]."* U.S. EPA construes 40 C.F.R. section 122.44(d)(1)(vii)(B) to mean that "*when WLA's are available, they must be used to translate water quality standards into NPDES permit limits.*" 54 Fed. Reg. 23868, 23879 (2 June 1989).

The San Joaquin River is subject to TMDL's for diazinon and chlorpyrifos and methylmercury, and WLA's under those TMDL's are available. The Central Valley Water Board developed WQBEL's for these pollutants pursuant to 40 C.F.R. section 122.44(d)(1)(vii), which does not require or contemplate an RPA.

i. **Diazinon and Chlorpyrifos**

(a) **WQO.** The Central Valley Water Board completed a TMDL for diazinon and chlorpyrifos in the Sacramento-San Joaquin Delta and amended the Basin Plan to include diazinon and chlorpyrifos WLA's and water quality objectives. The Basin Plan Amendment for the Control of Diazinon and Chlorpyrifos Runoff into the Sacramento-San Joaquin Delta was adopted by the Central Valley Water Board on 23 June 2006 and became effective on 10 October 2007.

The amendment modified Basin Plan Chapter III (Water Quality Objectives) to establish site-specific numeric objectives for diazinon and chlorpyrifos in the Delta waterways and identified the requirements to

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meet the additive formula already in Basin Plan Chapter IV (Implementation) for the additive toxicity of diazinon and chlorpyrifos.

The amendment states that "*The WLA's for all NPDES-permitted dischargers…shall not exceed the sum (S) of one (1) as defined below.*

$$S = \frac{C_d}{WQO_d} + \frac{C_c}{WQO_c} \leq 1.0$$

Where:

C_D = diazinon concentration in µg/L of point source discharge for WLA…
C_C = chlorpyrifos concentration in µg/L of point source discharge for the WLA…
WQO_d = acute or chronic diazinon water quality objective in µg/L.
WQO_c = acute or chronic chlorpyrifos water quality objective in µg/L.

Available samples collected within the applicable averaging period for the water quality objective will be used to determine compliance with the allocations and loading capacity. For purposes of calculating the sum (S) above, analytical results that are reported as 'non-detectable' concentrations are considered to be zero."

Appendix A of the Diazinon and Chlorpyrifos TMDL lists waterways subject to the TMDL and includes the San Joaquin River.

(b) **RPA Results.** Diazinon was not detected in the effluent based on six samples collected between January 2015 and December 2017. Diazinon was not detected in the upstream receiving water based on two samples collected between January 2015 and December 2017.

Chlorpyrifos was not detected in the effluent based on three samples collected between January 2015 and December 2017. Chlorpyrifos was not monitored in the upstream receiving water between January 2015 and December 2017.

Although diazinon and chlorpyrifos were not detected in the effluent or receiving water, due to the TMDL for diazinon and chlorpyrifos in the Sacramento-San Joaquin Delta, WQBEL's for these constituents are required. The TMDL WLA applies to all NPDES dischargers to Delta waterways and will serve as the basis for WQBEL's for this Facility.

(c) **WQBEL's.** WQBEL's for diazinon and chlorpyrifos are required based on the TMDL for diazinon and chlorpyrifos for Sacramento-San Joaquin Delta waterways. Therefore, this Order includes effluent limits calculated based on the WLA's contained in the TMDL, as follows:

(1) Average Monthly Effluent Limitation (AMEL)

$$S_{AMEL} = \frac{C_{D\,AVG}}{0.079} + \frac{C_{C\,AVG}}{0.012} \leq 1.0$$

$C_{D\text{-}avg}$ = average monthly diazinon effluent concentration in µg/L

$C_{C\text{-}avg}$ = average monthly chlorpyrifos effluent concentration in µg/L

(2) Average Weekly Effluent Limitation (AWEL)

$$S_{AWEL} = \frac{C_{D\,W-AVG}}{0.14} + \frac{C_{C\,W-AVG}}{0.021} \leq 1.0$$

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$C_{D\,W\text{-}AVG}$ = average weekly diazinon effluent concentration in µg/L

$C_{C\,W\text{-}AVG}$ = average weekly chlorpyrifos effluent concentration in µg/L

(d) **Plant Performance and Attainability.** Diazinon and chlorpyrifos were not detected in the effluent. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

ii. **Mercury**

(a) **WQO.** The Basin Plan contains fish tissue objectives for all Sacramento-San Joaquin Delta waterways listed in Appendix 43 of the Basin Plan, which states, "*…the average methylmercury concentrations shall not exceed 0.08 and 0.24 mg methylmercury/kg, wet weight, in muscle tissue of trophic level 3 and 4 fish, respectively (150-500 mm total length). The average methylmercury concentrations shall not exceed 0.03 mg methylmercury/kg, wet weight, in whole fish less than 50 mm in length.*" The Delta Mercury Control Program contains aqueous methylmercury WLA's that are calculated to achieve these fish tissue objectives. Methylmercury reductions are assigned to dischargers with concentrations of methylmercury greater than 0.06 ng/L (the concentration of methylmercury in water to meet the fish tissue objective). The Facility is allocated 0.030 grams/year of methylmercury by 31 December 2030, as listed in Table IV-7B of the Basin Plan.

The CTR contains a human health criterion of 50 ng/L for total mercury for waters from which both water and aquatic organisms are consumed. However, in 40 C.F.R. part 131, U.S. EPA acknowledges that the human health criteria may not be protective of some aquatic or endangered species and that "*…more stringent mercury limits may be determined and implemented through the use of the State's narrative criterion.*" In the CTR, U.S. EPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date.

The State Water Board adopted Resolution 2017-0027 on 2 May 2017, which approved *Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions* (Statewide Mercury Provisions). The Statewide Mercury Provisions establish a Sport Fish Water Quality Objective of an average 0.2 mg/kg methylmercury fish tissue concentration within a calendar year for waters with the beneficial uses of commercial and sport fishing (COMM), tribal tradition and culture (CUL), wildlife habitat (WILD), and marine habitat (MAR). This fish tissue objective corresponds to a water column concentration of 12 ng/L of total mercury for flowing water bodies (e.g., rivers, creeks, streams, and waters with tidal mixing). As shown in Table F-3, the beneficial uses of the San Joaquin River within the Sacramento-San Joaquin Delta include COMM and WILD; therefore, the Sport Fish Water Quality Objective is applicable. However, the mercury water quality objectives established in the Statewide Mercury Provisions do not supersede the site-specific numeric mercury water quality objectives established in the Basin Plan, and Section IV.D.1 of the Statewide Mercury Provisions specify that the implementation provisions pertaining to do not apply to dischargers that discharge to receiving waters for which a mercury or methylmercury

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TMDL is established pertaining to the same beneficial use or uses. Consequently, this Order continues to implement the Basin Plan's Delta Mercury Control Program for the control of methylmercury in the receiving water.

(b) **RPA Results.** Section 1.3 of the SIP states, "*The RWQCB shall conduct the analysis in this section of each priority pollutant with an applicable criterion or objective,* ***excluding priority pollutants for which a TMDL has been developed,*** *to determine if a water quality-based effluent limitation is required in the Discharger's permit."* (emphasis added)

The MEC for mercury was 38.9 ng/L based on 24 samples collected between January 2015 and December 2017. The maximum observed upstream receiving water mercury concentration was 75.7 ng/L based on one sample collected between January 2015 and December 2017.

The MEC for methylmercury was 0.0744 ng/L based on 24 samples collected between January 2015 and December 2017. The maximum observed upstream receiving water mercury concentration was 0.040 ng/L based on one sample collected between January 2015 and December 2017.

(c) **WQBEL's.** The Basin Plan's Delta Mercury Control Program includes WLA's for POTW's in the Delta, including for the Discharger. This Order contains a final WQBEL for methylmercury based on the WLA. Effective 31 December 2030, the total calendar annual methylmercury load shall not exceed 0.030 grams.

(d) **Plant Performance and Attainability.** A compliance schedule in accordance with the State Water Board's Compliance Schedule Policy and the Delta Mercury Control Program has been established in section VI.C.7.a of this Order. The final WQBEL's for methylmercury are effective 31 December 2030.

b. **Constituents with No Reasonable Potential.** WQBEL's are not included in this Order for constituents that do not demonstrate reasonable potential to cause or contribute to an in-stream excursion of an applicable water quality objective; however, monitoring for those pollutants is established in this Order as required by the SIP. If the results of effluent monitoring demonstrate reasonable potential, this Order may be reopened and modified by adding an appropriate effluent limitation.

Most constituents with no reasonable potential are not discussed in this Order. This section only provides the rationale for the RPA's for the following constituents of concern that were found to have no reasonable potential after assessment of the data:

i. **Salinity**

(a) **WQO.** The Basin Plan contains a chemical constituent objective that incorporates state MCL's, contains a narrative objective, and contains numeric water quality objectives for certain specified water bodies for electrical conductivity, total dissolved solids, sulfate, and chloride In addition, the Basin Plan contains numeric site-specific water quality objectives for electrical conductivity and chloride for the San Joaquin River in the vicinity of the discharge. The site-specific objectives for electrical conductivity are for the protection of the agricultural supply and fish and

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wildlife beneficial uses. The site-specific objectives for chloride are for protection of the MUN beneficial use.

There are no water quality criteria for the protection of aquatic life for electrical conductivity, total dissolved solids, or sulfate. However, water quality criteria for chloride are available for interpretation of the Basin Plan's narrative toxicity objective. The U.S. EPA National Ambient Water Quality Criteria (NAWQC) for Chloride recommends acute and chronic criteria for the protection of aquatic life.

Table F-13. Salinity Water Quality Criteria/Objectives

Parameter	Bay-Delta Plan[1]	Secondary MCL[2]	U.S. EPA NAWQC	Effluent	
				Average[3]	Max
Chloride (mg/L)	150	250, 500, 600	860 1-hr 230 4-day	169	180
Electrical Conductivity (µmhos/cm) or Total Dissolved Solids (mg/L)	440-2,200 or N/A	900, 1,600, 2,200 or 500, 1,000, 1,500	N/A	1,190 or 660	1,490 or 714
Sulfate (mg/L)	N/A	250, 500, 600	N/A	122	174

1 The Bay-Delta Plan includes water quality objectives for electrical conductivity in the San Joaquin River at Jersey Point (see Table F-13, below) and for chloride at the Antioch Water Works Intake (see Table F-12, below).

2 The Secondary MCL's are for protection of public welfare and are stated as a recommended level, upper level, and a short-term maximum level.

3 Maximum calendar annual average.

(1) **Chloride.** The Secondary MCL for chloride is 250 mg/L as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The NAWQC acute criterion for the protection of freshwater aquatic life for chloride is 860 mg/L and the chronic criterion is 230 mg/L.

The Basin Plan contains site-specific water quality objectives for chloride in the San Joaquin River at the Antioch Water Works Intake based on the 2006 Bay-Delta Plan, described as follows:

Table F-14. Water Quality Objectives for Chloride

Water Year Type	No. of Days Each Calendar Year <150 mg/L Cl^{-} [1,2]
Wet	240 (66%)
Above Normal	190 (52%)
Below Normal	175 (48%)
Dry	165 (45%)
Critical	155 (42%)

1 Maximum mean daily chloride concentrations of 150 mg/L for at least the number of days shown during the calendar year.

2 Must be provided in intervals of not less than 2 weeks duration (percentage of calendar year shown in parentheses).

(2) **Electrical Conductivity or Total Dissolved Solids.** The Secondary MCL for electrical conductivity is 900 µmhos/cm as a recommended level, 1,600 µmhos/cm as an upper level, and 2,200 µmhos/cm as a short-term maximum, or when expressed as total dissolved solids is 500 mg/L as a recommended level, 1,000 mg/L as an upper level, and 1,500 mg/L as a short-term maximum.

The Basin Plan contains site-specific water quality objectives for electrical conductivity for the San Joaquin River at Jersey Point based on the 2006 Bay-Delta Plan. The water quality objective is at times 450 µmhos/cm for protection of agricultural supply and 440 µmhos/cm for protection of striped bass spawning. The electrical conductivity objectives vary depending on the water year type and are applied as 14-day running average of the mean daily electrical conductivity, as detailed in the table below:

Table F-15. Water Quality Objectives for Electrical Conductivity

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 31 May	440	440	440	440	2,200
1 June – 14 June	450	450	450	1,350	2,200
15 June – 19 June	450	450	450	1,350	2,200
20 June – 15 August	450	450	740	1,350	2,200

The Bay-Delta Plan, Chapter IV – Program of Implementation, requires that the electrical conductivity objectives for protection of the agricultural supply and fish and wildlife beneficial uses be implemented through water rights actions. Consequently, compliance with the Bay-Delta Plan's electrical conductivity objectives is met through reservoir operations by DWR and USBR. The electrical conductivity of the San Joaquin River at Jersey Point fluctuates throughout the year, primarily based on the outflow of the river to the San Francisco Bay. An evaluation of historical compliance from 1990 to 2017 was performed and the results of the evaluation are summarized in the table below. Not considering the exceedances during the Jones Tract levee break in June 2004, which was an unusual event, the San Joaquin River at Jersey Point has been in compliance with the objectives for all but 13 days in the last 23 years.

Table F-16. Historical Compliance with Electrical Conductivity Objectives at Jersey Point (Water Years 1990 – 2017)

Water Year Type	Number of Water Years of this Type	Number of Water Years with Exceedances	Water Year with Exceedances (number of days)	Applicable Objectives[1] (µmhos/cm)
Wet	8	0	--	440, 450
Above Normal	4	1	2005 (3)	440, 450
Below Normal	3	1	2004 (12)[2]	440, 450, 740
Dry	5	0	--	440, 1,350
Critical	8	1	2015 (10)	2,200

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Water Year Type	Number of Water Years of this Type	Number of Water Years with Exceedances	Water Year with Exceedances (number of days)	Applicable Objectives[1] (µmhos/cm)

[1] Objectives apply from 1 April through 15 August as 14-day running daily averages. Objectives change in certain water years partway through June.

[2] The Jones Tract levee break occurred on 3 June 2004, and was closed on 30 June 2004. The exceedances of the applicable criteria, 450 µmhos/cm as 14-day running averages, occurred from 10-21 June 2004.

(3) **Sulfate.** The Secondary MCL for sulfate is 250 mg/L as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum.

(b) **RPA Results**

(1) **Chloride.** Chloride concentrations in the effluent ranged from 156 mg/L to 180 mg/L, with a maximum annual average of 169 mg/L, based on three samples collected between January 2015 and December 2017. The maximum annual average does not exceed the Secondary MCL recommended level and the maximum effluent chloride concentration of 180 mg/L does not exceed the NAWQC criteria for the protection of freshwater aquatic life. The maximum observed receiving water chloride concentration was 192 mg/L based on two samples collected between January 2015 and December 2017.

Based on modeling conducted by the Discharger, the maximum incremental increase of chloride caused by the discharge when the receiving water is at 150 mg/L (i.e., the most stringent Basin Plan objective) is estimated to be only 0.022 mg/L. This immeasurable increase is insignificant; therefore, the effluent does not have a reasonable potential to cause or contribute to an exceedance of the Basin Plan's site-specific objectives for chloride.

(2) **Electrical Conductivity or Total Dissolved Solids.** A review of the Discharger's monitoring reports shows a maximum observed annual average electrical conductivity of 1,190 µmhos/cm, with a range from 792 µmhos/cm to 1,490 µmhos/cm. As discussed above, the receiving water has been consistently in compliance with the Bay-Delta objectives resulting in available assimilative capacity for consideration in the RPA.

Based on modeling conducted by the Discharger, the estimated maximum incremental increase in electrical conductivity that may be caused by the discharge is 3.0 µmhos/cm, which is offset by a decrease in electrical conductivity due to the discharge increasing the outflow of the San Joaquin River that reduces seawater intrusion from the San Francisco Bay. The net worst-case increase is estimated to be approximately 2.0 µmhos/cm. Considering the large dilution and assimilative capacity in the receiving water, the small increase in electrical conductivity caused by the discharge does not result in a reasonable potential to cause or contribute to an exceedance of the objectives for electrical conductivity in the receiving water.

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Total dissolved solids concentrations in the effluent ranged from 602 mg/L to 714 mg/L, with a maximum annual average of 660 mg/L based on three samples collected between January 2015 and December 2017. For the same reasons as for electrical conductivity, above, the discharge does not have reasonable potential to cause or contribute to an exceedance of the objectives for total dissolved solids in the receiving water.

(3) **Sulfate.** Sulfate concentrations in the effluent ranged from 85.9 mg/L to 174 mg/L, with a maximum annual average of 122 mg/L based on three samples collected between January 2015 and December 2017. These levels do not exceed the Secondary MCL recommended level. The maximum observed receiving water sulfate concentration was 35.9 mg/L based on two samples collected between January 2015 and December 2017.

The discharge does not have reasonable potential to cause or contribute to an in-stream excursion above water quality objectives for salinity. However, since the Discharger discharges to the San Joaquin River within the legal boundary of the Sacramento-San Joaquin Delta, of additional concern is the salt contribution to Delta waters. Allowing the Discharger to increase its current salt loading may be contrary to the Region-wide effort to address salinity in the Central Valley. Therefore, this Order retains the AMEL for electrical conductivity of 1,505 µmhos/cm from Order R5-2013-0157-01, which is based on the electrical conductivity concentration used in the Discharger's antidegradation analysis for the existing Facility. Analysis of the effluent data shows that the maximum observed effluent electrical conductivity is 1,490 µmhos/cm, which is less than the AMEL. Therefore, based on the sample results for electrical conductivity in the effluent, it appears the Discharger can consistently comply with the effluent limit.

c. **Constituents with No Data or Insufficient Data.** Reasonable potential cannot be determined for the following constituents because effluent data are limited or ambient background concentrations are not available. The Discharger is required to continue to monitor for these constituents in the effluent using analytical methods that provide the best feasible detection limits. When additional data become available, further analysis will be conducted to determine whether to add numeric effluent limitations or to continue monitoring.

i. **Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene**

(a) **WQO.** The CTR includes a criterion of 0.0044 µg/L for benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene (applicable to each individual parameter) for the protection of human health for waters from which both water and organisms are consumed.

(b) **RPA Results.** As shown in the table below, based on data collected between January 2015 and December 2017, the MEC's for these parameters exceed the applicable CTR criterion. These parameters were not detected in the upstream receiving water based on two samples collected from January 2015 through December 2017.

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Table F-17. Summary of Effluent Data for Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene

Parameter	Effluent				Background (µg/L)	Lowest MDL (µg/L)	Lowest RL (µg/L)	SIP ML (µg/L)
	MEC (µg/L)	No. of Samples	No. of ND	No. of DNQ				
Benzo(a)pyrene	0.423 (DNQ)	3	2	1	<0.40	0.40	0.96	2.0
Benzo(b)fluoranthene	0.375 (DNQ)	3	2	1	<0.37	0.37	0.96	10
Dibenzo(a,h)anthracene	0.883 (DNQ)	3	2	1	<0.37	0.37	0.96	0.1
Indeno(1,2,3-cd)pyrene	0.714 (DNQ)	3	2	1	<0.38	0.38	0.96	0.05

Section 2.4.2 of the SIP states that the minimum level (ML) is the lowest quantifiable concentration in a sample based on the proper application of all method-based analytical procedures and the absence of any matrix interferences.

(1) Required ML's are listed in Appendix 4 of the SIP. Where more than one ML is listed in Appendix 4, the Discharger may select any one of the cited analytical methods for compliance determination. The selected ML used for compliance determination is referred to as the reporting level (RL).

(2) An RL can be lower than the ML in Appendix 4 only when the Discharger agrees to use an RL that is lower than the ML listed in Appendix 4. The Central Valley Water Board and the Discharger have no agreement to use a RL lower than the listed ML.

(3) Section 1.2 of the SIP requires that the Regional Board use all available, valid, relevant, representative data and information, as determined by the Regional Board, to implement the SIP. Section 1.2 of the SIP further states that the Regional Board has the discretion to consider if any data are inappropriate or insufficient for use in implementing the SIP.

(4) Data reported below the ML indicates the data may not be valid due to possible matrix interferences during the analytical procedure.

(5) Further, section 2.4.5 of the SIP (Compliance Determination) supports the insufficiency of data reported below the ML or RL. In part, it states, "*Dischargers shall be deemed out of compliance with an effluent limitation, for reporting and administrative enforcement purposes, if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the RL.*" Thus, if submitted data is below the RL, that data cannot be used to determine compliance with effluent limitations.

(6) Data reported below the ML is not considered valid data for use in determining reasonable potential. Therefore, in accordance with section 1.2 of the SIP, the Central Valley Water Board has determined that data reported below the ML is inappropriate and insufficient to be used to determine reasonable potential.

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(7) In implementing its discretion, the Central Valley Water Board is not finding that reasonable potential does not exist; rather the Central Valley Water Board cannot make such a determination given the invalid data. Therefore, the Central Valley Water Board will require additional monitoring for such constituents until such time a determination can be made in accordance with the SIP policy.

The applicable ML's specified in SIP Appendix 4 for benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are summarize in Table F-15. The Discharger used analytical methods that were more sensitive than the ML's required by the SIP for all effluent samples for these parameters and the results were all non-detects or estimated values (i.e., detected but not quantified). Therefore, the effluent data for benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene is inappropriate and insufficient to determine reasonable potential under the SIP.

Section 1.3, step 8 of the SIP allows the Central Valley Water Board to require additional monitoring for a pollutant in place of an effluent limitation if data are unavailable or insufficient. Instead of effluent limitations, monitoring for benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene will be required quarterly during the year 2021 as part of the effluent characterization. Should monitoring results indicate that the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality standard, this Order may be reopened and modified by adding an appropriate effluent limitation.

d. **Constituents with Reasonable Potential.** The Central Valley Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard for ammonia, BOD_5, copper, lead, nitrate plus nitrite, pH, temperature, total coliform organisms, and TSS. WQBEL's for these constituents are included in this Order. A summary of the RPA is provided in Attachment G and a detailed discussion of the RPA for each constituent is provided below.

i. **Ammonia**

(a) **WQO.** The 1999 U.S. EPA NAWQC for the protection of freshwater aquatic life for total ammonia (the "1999 Criteria"), recommends acute (1-hour average; criteria maximum concentration or CMC) standards based on pH and chronic (30-day average; criteria continuous concentration or CCC) standards based on pH and temperature. U.S. EPA also recommends that no 4-day average concentration should exceed 2.5 times the 30-day CCC.

U.S. EPA published national recommended water quality criteria for the protection of aquatic life from the toxic effects of ammonia in freshwater (the "2013 Criteria").[1] The 2013 Criteria is an update to U.S. EPA's 1999 Criteria and varies based on pH and temperature. Although the 2013 Criteria reflects the latest scientific knowledge on the toxicity of ammonia to certain freshwater aquatic life, including new toxicity data on sensitive

[1] Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater, published August 2013 [EPA 822-R-13-001]

freshwater mussels in the Family Unionidae, the species tested for development of the 2013 Criteria may not be present in some Central Valley waterways. The 2013 Criteria document therefore states that, "*unionid mussel species are not prevalent in some waters, such as the arid west …*" and provides that, "*In the case of ammonia, where a state demonstrates that mussels are not present on a site-specific basis, the recalculation procedure may be used to remove the mussel species from the national criteria data set to better represent the species present at the site.*"

The Central Valley Water Board issued a 3 April 2014 *California Water Code section 13267 Order for Information: 2013 Final Ammonia Criteria for Protection of Freshwater Aquatic Life* (13267 Order) requiring the Discharger to either participate in an individual or group study to determine the presence of mussels or submit a method of compliance for complying with effluent limitations calculated assuming mussels present using the 2013 Criteria. The Discharger submitted a letter to the Central Valley Water Board indicating their participation in the Central Valley Clean Water Association (CVCWA) Freshwater Collaborative Mussel Study. Studies are currently underway to determine how the latest scientific knowledge on the toxicity of ammonia reflected in the 2013 Criteria can be implemented in the Central Valley Region as part of a Basin Planning effort to adopt nutrient and ammonia objectives. Until the Basin Planning process is completed, the Central Valley Water Board will continue to implement the 1999 Criteria to interpret the Basin Plan's narrative toxicity objective. The 1999 Criteria recommends acute (1-hour average; criteria maximum concentration or CMC) standards based on pH and chronic (30-day average; criteria continuous concentration or CCC) standards based on pH and temperature. U.S. EPA also recommends that no 4-day average concentration should exceed 2.5 times the 30-day CCC. U.S. EPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature. Because the San Joaquin River has a beneficial use of cold freshwater habitat and the presence of salmonids and early fish life stages is well-documented, the recommended criteria for waters where salmonids and early life stages are present were used.

The maximum permitted effluent pH is 8.5, as the Basin Plan objective for pH in the receiving stream is the range of 6.5 to 8.5. In order to protect against the worst-case short-term exposure of an organism, a pH value of 8.5 was used to derive the acute criterion. The resulting acute criterion is 2.14 mg/L.

As described in Attachment E to this Order, the Discharger participates in the Delta Regional Monitoring Program and Order R5-2013-0157-01 did not include monitoring requirements for pH in the receiving water. Therefore, a chronic criterion was calculated for each day when paired pH and temperature data were measured using effluent pH and temperature data. Rolling 30-day average criteria were calculated from effluent data using the criteria calculated for each day and the minimum observed 30-

day average criterion was established as the applicable 30-day average chronic criterion, or 30-day CCC. The most stringent 30-day CCC was 2.63 mg/L (as N) based on effluent pH and temperature data collected from January 2015 through December 2017. The 4-day average concentration is derived in accordance with the U.S. EPA criterion as 2.5 times the 30-day CCC. Based on the 30-day CCC of 2.63 mg/L (as N), the 4-day average concentration that should not be exceeded is 6.57 mg/L (as N).

(b) **RPA Results.** The Facility is a POTW that treats domestic wastewater. Untreated domestic wastewater contains ammonia in concentrations that are harmful to aquatic life and exceed the Basin Plan narrative toxicity objective. Federal regulations at 40 C.F.R. section 122.44(d)(1)(i) require that, "*Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.*" For priority pollutants, the SIP dictates the procedures for conducting the RPA. Ammonia is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used professional judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent.

U.S. EPA's September 2010 NPDES Permit Writer's Manual, page 6-30, states, "*State implementation procedures might allow, or even require, a permit writer to determine reasonable potential through a qualitative assessment process without using available facility-specific effluent monitoring data or when such data are not available…A permitting authority might also determine that WQBEL's are required for specific pollutants for all facilities that exhibit certain operational or discharge characteristics (e.g., WQBEL's for pathogens in all permits for POTW's discharging to contact recreational waters).*" U.S. EPA's TSD also recommends that factors other than effluent data should be considered in the RPA, "*When determining whether or not a discharge causes, has the reasonable potential to cause, or contributes to an excursion of a numeric or narrative water quality criterion for individual toxicants or for toxicity, the regulatory authority can use a variety of factors and information where facility-specific effluent monitoring data are unavailable. These factors also should be considered with available effluent monitoring data.*" With regard to POTW's, U.S. EPA recommends that, "*POTW's should also be characterized for the possibility of chlorine and ammonia problems.*" (TSD, p. 50)

Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The Discharger currently uses nitrification to remove ammonia from the waste stream. Inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in

surface waters. Discharges of ammonia in concentrations that produce detrimental physiological responses to human, plant, animal, or aquatic life would violate the Basin Plan's narrative toxicity objective. Although the Discharger nitrifies the discharge, inadequate or incomplete nitrification creates the potential for ammonia to be discharged and provides the basis for the discharge to have a reasonable potential to cause or contribute to an in-stream excursion above the NAWQC. Therefore, the Central Valley Water Board finds the discharge has reasonable potential for ammonia and WQBEL's are required.

(c) **WQBEL's.** The Central Valley Water Board calculates WQBEL's in accordance with SIP procedures for non-CTR constituents, and ammonia is a non-CTR constituent. The SIP procedure assumes a 4-day averaging period for calculating the long-term average discharge condition (LTA). However, U.S. EPA recommends modifying the procedure for calculating permit limits for ammonia using a 30-day averaging period for the calculation of the LTA corresponding to the 30-day CCC and specifies that "*...the value of "n" (assumed monitoring frequency) used in the AML calculation should not be less than the averaging period upon which the criterion value is based*".[1] Therefore, while the LTA's corresponding to the acute and 4-day chronic criteria were calculated according to SIP procedures, the LTA and AMEL multiplier corresponding to the 30-day CCC was calculated assuming a 30-day averaging period and a monthly sampling frequency (n) of 30. The lowest LTA representing the acute, 4-day CCC, and 30-day CCC is then selected for deriving the AMEL and the AWEL. The remainder of the WQBEL calculation for ammonia was performed according to the SIP procedures. This Order contains a final AMEL and AWEL for ammonia of 0.89 mg/L and 1.7 mg/L, respectively, based on the NAWQC.

(d) **Plant Performance and Attainability.** Analysis of the effluent data shows that the maximum observed effluent ammonia concentration of 0.40 mg/L is less than the applicable WQBEL's. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

ii. **Copper**

(a) **WQO.** The CTR includes hardness-dependent criteria for the protection of freshwater aquatic life for copper. These criteria for copper are presented in dissolved concentrations, as 1-hour acute criteria and 4-day chronic criteria. U.S. EPA recommends conversion factors to translate dissolved concentrations to total concentrations. Default U.S. EPA translators were used for the effluent and receiving water. As described in section IV.C.2.e of this Fact Sheet, the applicable acute and chronic criteria for copper in the effluent are 12 µg/L and 8.4 µg/L, respectively, as total recoverable.

The Basin Plan includes a site-specific objective for the Sacramento-San Joaquin Delta of 10 µg/L (dissolved) as a maximum concentration. Using the default U.S. EPA translator, the Basin Plan objective for copper is 10.4 µg/L (total recoverable).

[1] 64 FR 71974

Footnote 4, page 3 of the Introduction of the SIP states, "*If a water quality objective and a CTR criterion are in effect for the same priority pollutant, the more stringent of the two applies*." The Basin Plan objective cannot be directly compared to the CTR criteria to determine the most stringent objective because they have different averaging periods and the CTR criteria vary with hardness. In this situation, the RPA has been conducted considering both the CTR criteria and the Basin Plan site-specific objective.

(b) **RPA Results.** The MEC for copper in the effluent was 10.5 µg/L based on three samples collected between January 2015 and December 2017. The maximum observed upstream receiving water copper concentration was 4.02 µg/L based on two samples collected between January 2015 and December 2017. Therefore, copper in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for the protection of freshwater aquatic life and the Basin Plan site-specific objective.

(c) **WQBEL's.** The receiving water contains assimilative capacity for copper; therefore, as discussed in section IV.C.2.c, an acute aquatic life dilution credit of 20:1 and a chronic aquatic life dilution credit of 28:1 were allowed in the development of WQBEL's for copper. Based on the allowable dilution credits, this Order contains an AMEL of 18 µg/L and an MDEL of 36 µg/L based on the CTR criteria for the protection of freshwater aquatic life and the Basin Plan objective.

(d) **Plant Performance and Attainability.** Analysis of the effluent data shows that the MEC of 10.5 µg/L is less than the applicable WQBEL's. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

iii. **Lead**

(a) **WQO.** The CTR includes hardness-dependent criteria for the protection of freshwater aquatic life for lead. These criteria for lead are presented in dissolved concentrations, as 1-hour acute criteria and 4-day chronic criteria. U.S. EPA recommends conversion factors to translate dissolved concentrations to total concentrations. Default U.S. EPA translators were used for the effluent and receiving water. As described in section IV.C.2.e of this Fact Sheet, the applicable acute and chronic criteria for lead in the effluent are 56 µg/L and 2.2 µg/L, respectively, as total recoverable.

(b) **RPA Results.** The MEC for lead in the effluent was 3.9 µg/L based on three samples collected between January 2015 and December 2017. The maximum observed upstream receiving water lead concentration was 0.419 µg/L based on two samples collected between January 2015 and December 2017. Therefore, lead in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for the protection of freshwater aquatic life.

(c) **WQBEL's.** The receiving water contains assimilative capacity for lead; therefore, as discussed in section IV.C.2.c, a chronic aquatic life dilution credit of 11.5:1 was allowed in the development of WQBEL's for lead. Based on the allowable dilution credits, this Order contains an AMEL of

7.5 µg/L and an MDEL of 15 µg/L based on the CTR criteria for the protection of freshwater aquatic life.

(d) **Plant Performance and Attainability.** Analysis of the effluent data shows that the MEC of 3.9 µg/L is less than the applicable WQBEL's. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

iv. **Nitrate and Nitrite**

(a) **WQO.** The State Water Board, Division of Drinking Water (DDW) has adopted Primary MCL's for the protection of human health for nitrite and nitrate that are equal to 1.0 mg/L and 10 mg/L (measured as nitrogen), respectively. DDW has also adopted a Primary MCL of 10 mg/L for the sum of nitrate and nitrite, measured as nitrogen.

U.S. EPA has developed a Primary MCL and an MCL goal of 1.0 mg/L for nitrite (measured as nitrogen). For nitrate, U.S. EPA has developed Drinking Water Standards (10 mg/L as Primary MCL) and NAWQC for protection of human health (10 mg/L for non-cancer health effects).

(b) **RPA Results.** The Facility is a POTW that treats domestic wastewater. Untreated domestic wastewater contains ammonia in concentrations that, if untreated, will be harmful to fish and will violate the Basin Plan's narrative toxicity objective. This Order, therefore, requires removal of ammonia (i.e., nitrification). Nitrification is a biological process that converts ammonia to nitrate and nitrite, and will result in effluent nitrate concentrations above the Primary MCL for nitrate plus nitrite. Nitrate concentrations in a drinking water supply above the Primary MCL threaten the health of human fetuses and newborn babies by reducing the oxygen-carrying capacity of the blood (methemoglobinemia).

Federal regulations at 40 C.F.R. section 122.44(d)(1)(i) require that, "*Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.*" For priority pollutants, the SIP dictates the procedures for conducting the RPA. Nitrate and nitrite are not priority pollutants. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used professional judgment in determining the appropriate method for conducting the RPA for these non-priority pollutant constituents.

U.S. EPA's September 2010 NPDES Permit Writer's Manual, page 6-30, states, "*State implementation procedures might allow, or even require, a permit writer to determine reasonable potential through a qualitative assessment process without using available facility-specific effluent monitoring data or when such data are not available…A permitting authority might also determine that WQBEL's are required for specific pollutants for all facilities that exhibit certain operational or discharge characteristics (e.g., WQBEL's for pathogens in all permits for POTW's discharging to contact recreational waters).*" U.S. EPA's TSD also

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